

HATCHERY AND GENETIC MANAGEMENT PLAN

Hatchery Program:

Lower Elwha Fish Hatchery

**Species or
Hatchery Stock:**

Chum; *Oncorhynchus keta*

Agency/Operator:

Elwha Klallam Tribe

Watershed and Region:

Elwha River; WRIA 18.0274

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HATCHERY AND GENETIC MANAGEMENT PLAN LOWER ELWHA FISHERIES OFFICE CHUM SALMON ENHANCEMENT PROGRAM

SECTION 1. GENERAL PROGRAM DESCRIPTION

- 1.1 Lower Elwha Fish Hatchery: Chum salmon program
- 1.2 Species and population (or stock) under propagation and ESA status: Chum salmon, *Oncorhynchus keta*. Not identified as threatened or endangered.

- 1.3 Responsible organization and individuals:

Name (and title): Larry Ward, Fisheries Biologist

Agency or Tribe: Elwha Klallam Tribe

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Other agencies, Tribes, co-operators, or organizations involved including contractors and extent of involvement in the program:

Bureau of Indian Affairs: provides facility operating and maintenance budget (PL-638)

Point No Point Treaty Council: provides fisheries management support services

Northwest Indian Fisheries Commission: provides fisheries management support services, provides diagnostic fish health services

Washington Department of Fish and Wildlife. Co-manager with the Elwha Tribe on the Elwha River salmon fishery resource.

- 1.4 Funding source, staffing level, and annual hatchery program operational costs:

Funding via Bureau of Indian Affairs (PL-638),

Staffing level: 4

- 1.5 Location of hatchery and associated facilities:

Name of stream: Elwha River

River mile location: 0.25

Basin name: Elwha River

State: Washington

Watershed code: 18.0274

Regional mark processing center code: 99702

GIS entry information: lat/long: 123.33.00; 48.08.30

- 1.6. Type of program: Integrated recovery

- 1.7. Program goal: The goal of the Lower Elwha Fish Hatchery chum salmon plan is to:

- 1.7.1 Assist in the recovery of chum salmon stocks in the Elwha River

- 1.7.2 Minimize adverse ecological and behavioral effects upon listed stocks of chinook salmon

- 1.8 Program Goal and Justification: The hatchery program will be operated to:

- 1.8.1 Increase the total abundance of the composite natural/hatchery population in the Elwha River

- 1.8.2 Minimize adverse ecological and behavioral effects upon listed stocks of chinook salmon

1.9 and 1.10) Program performance standards and indicators

Program Goal	Performance Standard	Performance Indicator
1.8.1 Recover stocks of chum salmon in the Elwha River	Increase the total abundance of the composite natural/hatchery population	An increased number of fish returning to the river to spawn is observed
	Hatchery production of chum salmon meets the production goal of 75,000 eyed eggs for outplanting	A broodstock capture goal of 100 fish (50 pairs) is attained
		100 fish broodstock capture goal which will produce necessary component of minimum spawners
		100 spawners which will produce eggs necessary to meet annual hatchery production goal
		Egg take of 110,000 eggs will achieve an overall survival sufficient to produce 75,000 eggs for outplanting or fry release
	Fish diseases will be detected and treated when necessary to maintain and improve health in hatchery production	When appropriate, adult broodstock will be tested at levels sufficient to detect viral and bacterial infections
		Eggs will receive appropriate disinfection during incubation period to minimize fungal and bacterial infections
		Health of hatchery stocks will be monitored on a monthly basis and preventative actions strategies to maintain fish health will be recommended
1.8.2 Minimize adverse ecological and behavioral effects upon listed stocks of chinook salmon	Hatchery production of chum salmon has a minimal impact on the numbers and survival of listed salmon stocks	Health status of fry will be assessed prior to release from the facility
		Adult chinook are not targeted by broodstock capture program,
		Outplanting of eyed chum salmon eggs will occur in areas not utilized by chinook salmon for spawning.

1.11 Expected program size

1.11.1 Proposed annual broodstock collection level: 100 adults

1.11.2 Proposed annual release levels: 75,000 eyed eggs

1.12 Current program performance (1995 to present)

1.12.1 Survival rates

TABLE 1.12.1 CHUM SALMON SURVIVAL RATES

Life Stage	Percent Survival
Green to Eyed	90.2
Eyed to Emigration	88.5

1.12.2 Total adult production number: Spawner surveys indicate that the population is between 150-300 adults (USDI 1996).

1.12.3 Average facility escapement: NA

1.13 Program initiation date: 1995

1.14 Expected program duration: 12 years

1.15 Targeted watersheds: Elwha River watershed; WRIA 18.0274

1.16 Alternative actions: None. Migration of adults into upper Elwha River basin is blocked by Elwha and Glines hydroelectric projects

SECTION 2. PROGRAM EFFECTS ON ESA LISTED SALMONID POPULATIONS

2.1 ESA permits/authorizations in hand for hatchery program: none

2.2 ESA-listed natural populations in target area

2.2.1 Description of ESA-listed salmonid population:

stock: Elwha Fall Chinook, hatchery origin stock

adult age class structure: (1993 data) Age 3: 13.4%, Age 4: 20.6% Age 5: 64.9%
Age 6: 1%

sex ratio: Male: 54.6% Female: 45.4%

size range: NA

migration timing: Adult entry July to September, spawning August to October;

hatch: December to January, out-migration June.

juvenile life history strategy: Hatchery population is sub-yearling smolts

2.2.1.1 ESA-listed stock directly affected by the program: None

2.2.1.2 ESA-listed stock incidentally affected by the program: Elwha River Fall Chinook
Salmon (hatchery origin stock)

2.2.2 Status of ESA-listed salmonid population affected by the program:

2.2.2.1 Status: critical

2.2.2.2 Annual abundance estimates of Elwha River chinook salmon (1988-1999)

TABLE 2.2.2.2 ANNUAL ABUNDANCE OF ELWHA RIVER CHINOOK SALMON

Year	Escapement	Terminal Run	Pre-Terminal Catch
1988	7,873	8,666	417
1898	5,487	5,703	113
1990	3,180	3,605	39
1991	3,469	3,761	63
1992	3,859	4,002	54
1993	1,569	1,669	26
1994	1,546	1,580	42
1995	1,812	1,814	38
1996	1,875	1,883	7
1997	2,527	2,571	44
1998	2,409	2,418	7
1999	1,649	1,651	5
2000	1,959	1,966	6
2001	NA	1,913	NA
2002	NA	2,246	NA

2.2.3 Hatchery activities that may have led to the take of listed fish in the target area:

Elwha River chinook salmon adults of hatchery origin have in past years entered the trap at the Lower Elwha Fish Hatchery. Total observed returns number less than 50 in the past ten years. Chinook salmon encountered at the hatchery are separated from non-listed species and are either transported to the WDFW Elwha Rearing Channel or are returned to the Elwha River

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1 Alignment of the hatchery program with any ESU-wide hatchery plan: The hatchery program will be operated consistent with the Puget Sound Salmon Management Plan; The Draft Comprehensive Coho Management Plan; The Draft Comprehensive Chinook Management Plan; and The Salmonid Disease Control Policy of the Fisheries Managers of Washington State and the Elwha River Ecosystem

Restoration Act.

- 3.2 All cooperative agreements, memoranda of understanding, or other management plans or court orders under which the program operates: Memoranda of understanding detailing support of this project have been received from the USFWS, WDFW, and Olympic National Park.
- 3.3 Program relationships to harvest objectives: No directed harvest of chum salmon is currently being conducted or planned for.
- 3.4 Relationship to habitat protection and recovery strategies: Production of chum salmon in the Elwha River is severely limited by two hydroelectric projects located at RM 4.9 and 12.1 on the Elwha River. These dams lack fish passage structures and block access by salmon to all but the lower five miles of mainstem habitat. In addition, these two hydroelectric projects have prevented sediment and large woody debris transport from occurring, severely degrading the lower portions of the river. The population is largely confined to side channels in the lower mile of the river (USDI, 1996).

Short-term recovery and protection: In response to population declines staff of the Lower Elwha Klallam Fisheries Office has undertaken a number of protective measures designed to enhance chum populations. Recovery and protection efforts have focused upon maintenance of critical spawning and rearing habitat in the river and the restoration of mainstem habitat through the installation of engineered logjams.

Long-term recovery and protection: Recovery and protection efforts will focus upon the Elwha River Ecosystem Restoration Act (PL 102-495)(USDI 1996).

The act details the benefits and impacts to fish populations, their recovery and protection on the Elwha River resulting from the removal of the Elwha and Glines hydroelectric projects.

- 3.5 Ecological interactions Hatchery fish can interact with listed fish species through competition and predation (Fresh 1997). Program fish can negatively impact listed fish through reduced growth, survival and abundance. Several methods have been developed to assess potential negative ecological interactions and risks associated with hatchery programs (Pearsons and Hopley 1999; Ham and Pearsons 2001). The degree to which fish interact depends upon fish life-history characteristics which include: 1) size and morphology, 2) behavior, 3) habitat use and 4) movements (Flagg et al. 2000). Important considerations associated with hatchery practices include the type of species reared, fish size at time of release, number of fish released and location(s) of program releases. Interaction potential between hatchery origin fish and natural origin fish can certainly depend on habitat structure and system productivity. For example, habitat structure can influence predator-prey encounter rates (visibility), the amount of preferred spawning habitat and fish susceptibility to flushing flows. System productivity determines the degree to which fish populations may be food-limited, and thus negatively impacted by density-dependent effects. The type and degree of risk associated with releases of program fish typically involve complex mechanisms. Actual identification and magnitude of causal mechanisms negatively impacting listed fish is not always definitive due to confounding factors such as human-induced environmental changes, indirect pathway effects and the diversity of environments salmon occupy throughout their life-cycle (Li et al. 1987; Fausch 1988; Fresh 1997; Flagg et al. 2000). Given these complex mechanisms and site-specific considerations it is not surprising that for most hatchery programs, the extent of possible adverse competition and predation effects of hatchery releases on listed fish populations throughout Puget Sound have not been explicitly documented or qualified.

Given the perceived risks associated with hatchery programs, hatchery chum salmon are reared and released in a manner to minimize potential negative impacts on listed chinook salmon and bull trout populations (see Section 10.11). Outmigration timing studies scheduled to commence Spring 2003 will attempt to document the existence of predation of coho salmon on threatened and endangered stocks of natural-origin fish (see Section 12).

- 3.5.1 Species that could negatively impact program: sea lions, seals, river otters, piscivorous birds,
- 3.5.2 Species that could be negatively impacted by the program: none
- 3.5.3 Species that could positively impact the program: Chinook, coho, steelhead, and pink salmon
- 3.5.4 Species that could be positively impacted by the program: sea lions, seals, river otters, piscivorous birds,

SECTION 4. WATER SOURCE

- 4.1 Facility water source: Facility water is a mix of surface and ground water. Water quality of the facility is similar to that found in the Elwha River. Water temperature profile will be cooler during the summer and warmer during the winter due to the influence of the ground water component.

Surface water: Water is collected from a gravity-flow infiltration located at RM 1.5 of the Elwha River. Flow produced by this system varies seasonally from 600 GPM to 2,000 GPM. Historically this system produced 4,500 GPM.

Ground water: Two wells on the facility contribute a total of 1,400 GPM to the facility. Historical groundwater production levels averaged 2,000 GPM.

Permits: National Pollutant Discharge Elimination System (NPDES). *Tribal Hatcheries and Other Upland Aquaculture Facilities in the State of Washington.* Permit No. WA-G13-1000 (pending).

Compliance with NMFS screening criteria: No screening exists on surface water system. Water is acquired from a subsurface gravel filter.

- 4.2 Risk aversion measures to be applied: No listed species of salmon will be impacted by water withdrawals carried out by the facility. Listed adults which enter the hatchery by means of the hatchery outfall will either be returned to the Elwha River, or will be transported to the WDFW Elwha Rearing Channel for use in their production program.

SECTION 5. FACILITIES

- 5.1 Broodstock collection facilities: Broodfish are captured from the Elwha River and are either spawned at the site of capture or are transported to the Lower Elwha Hatchery to permit ripening prior to spawning. Green males and females are held separately prior to spawning.
- 5.2 Fish transportation equipment: Liver fish are transported to the hatchery by means of insulated fish totes.
- 5.3 Broodstock holding and spawning facilities: Holding facilities for the program consist of a 24 foot diameter fiberglass tanks. Spawning facilities for the program consist of two sheds. In these sheds fish are killed, bled and spawned.
- 5.4 Incubation facilities: The program uses an incubation facility with a maximum instantaneous incubational capacity of 6.7 million eggs. The facility is located on the hatchery grounds and is served by ground water, surface water, or a combination of

the two sources.

5.5 Rearing facilities: Rearing facilities consist of concrete raceways.

5.6 Acclimation/release facilities: Fish are outplanted as eyed eggs. No acclimation of fish occurs.

5.7 Operational difficulties/disasters which have led to significant fish mortality:

5.7.1 Flooding: Flooding has inundated broodstock holding facilities in the past, washing fish out from the adult holding ponds, stranding fish in the woods post-flood. Floods have inundated rearing ponds washing juvenile fish from the ponds.

5.7.2 Electrical power outages: Loss of electrical power resulted in pump failure and loss of groundwater production.

5.7.3 Emergency standby generator failure: Corrosion of generator computer components caused the generator to fail to start. Due to the system age, many of these components are no longer available as stock items and require production lead times of between three and five weeks to fabricate.

5.7.4 Pump failure: Shaft bearing failure on turbine pump caused pump shaft shear and loss of groundwater production.

5.7.5 Loss of groundwater: Elwha River channel migration has reduced the production potential of groundwater sources serving the hatchery facility.

5.7.6 Loss of groundwater: Migration of fines and fouling of intake screens by bacteria has reduced the production potential of the groundwater wells serving the hatchery facility.

5.7.7 Loss of surface water: Elwha River channel migration has reduced the production potential of groundwater sources serving the hatchery.

5.7.8 Disease outbreaks: None reported.

5.7.9 Mammalian predation: Predation by piscivorous mammals have resulted in the loss of an undocumented number of juvenile salmonids.

5.7.10 Avian predation: Predation by piscivorous birds has resulted in the loss of an undocumented number of juvenile salmonids.

5.8 Backup systems/risk aversion measures in place

5.8.1 Flooding: A flood reduction levee has been constructed by the US Army Corps of Engineers to address the issue of flooding. During flood events a flap-gate on the hatchery outfall is closed preventing the entry of floodwaters into the hatchery facility. During these flood events, flap-gate closure prevents either the return of adults to and the releases of juveniles from the hatchery.

5.8.2 Electrical power outages: Local PUD has upgraded the service entrance and transmissions lines leading to the facility.

5.8.3 Emergency standby generator: Computerized components for the generator system have been replaced and have been weatherized.

5.8.4 Pump failure: Pump production and operation is monitored regularly. Pumps receive regular servicing and inspections.

5.8.5 Fish theft: An infrared security system has been installed and is monitored 24/7.

5.8.6 Disease outbreaks: Fish health is monitored pro-actively. Rearing conditions are maintained to promote those levels identified as optimal for fish health. Adult females are injected with erythromycin to limit possible bacterial disease impacts

5.8.7 Predation: Netting systems have been upgraded to limit effects of avian predation. No risk aversion measures have been taken to limit mammalian predation.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

6.1 Source: Elwha River stock

6.2 Supporting information

- 6.2.1 History: The chum salmon program at the Lower Elwha Fish Hatchery originally began in 1976 and continued until 1985. This hatchery program was designed as an integrated harvest program and utilized broodstock from Wolcott Slough, Enatai Creek, Lyre River, and the Elwha River. From 1981 on this program utilized eggs exclusively from the Elwha River – either based upon returns to the hatchery rack or in-river captures of adult broodfish.
Current: The Integrated recovery program at the Lower Elwha Hatchery was begun in 1995 as part of an effort to stabilize declining chum salmon populations. Target broodfish collection levels have been stable, however the production strategy has shifted from year to year in response to available fish and rearing space.
- 6.2.2 Annual size: Naturally spawning population: 150 to 300 spawners (Wunderlich et al. 1994; Hiss 1995, USDI 1996)
- 6.2.3 Past and proposed level of natural fish in broodstock: The program is based exclusively upon the capture and spawning of natural origin fish.
- 6.2.4 Genetic or ecological differences: There are two distinct populations of chum salmon in the Elwha River. Genetic (electrophoretic) analysis of chum salmon in the Elwha River indicates that the early portion of the run is native Elwha stock, while the later run is made up of stocks imported to the river.
- 6.2.5 Reason for choice of stock: Selection of the stock was based upon its localized adaptation, unique genetic composition, and run timing characteristics.
- 6.3 Risk Aversion measures to be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices: No known adverse genetic or ecological effects to listed natural fish will result from current chum salmon broodstock selection practices.

SECTION 7 BROODSTOCK COLLECTION

- 7.1 Life history phase collected: Adults
- 7.2 Collection or sampling design: Chum production goals are achieved through the capture of adult broodstock (gill netting) in side channels and mainstem portions of the Elwha River. Capture sites include the mainstem Elwha River, the Boston Charlie Creek complex (WRIA 18.0275) and Sisson's Hole (WRIA undefined).
- 7.3 Identity: All fish returning to the hatchery facility are included in egg-take operations. Identity of hatchery-origin fish was re-affirmed.
- 7.4 Proposed number to be collected:
- 7.4.1 Program goal: 100 adults
- 7.4.2 Broodstock collection and hatchery production levels 1995 to present:

TABLE 7.4.2 BROODSTOCK COLLECTION, EGG TAKES AND RELEASES

Year	Females	Males	Green Eggs	Eyed Eggs	Eyed Eggs Outplanted	Fry Released
1995	20	NA	42,435	37,796	0	37,430
1996	27	26	55,154	45,621	14,900	26,731
1997	9	16	20,925	17,710	17,710	0
1998	26	26	69,174	62,638	57,600	5,000
1999	No capture of Broodstock Made					

2000	No capture of Broodstock Made					
2001	21	22	49,434	48,370	47,080	35,231 ¹
2002	20	19	65,678	62,782	59,600	
Average						

1. 11 incubators planted were not inventoried to evaluate survival to emigration.

- 7.5 Disposition of hatchery-origin fish collected in surplus of broodstock needs: Excess collection of chum salmon has not occurred.
- 7.6 Fish transportation and holding methods: When non-ripe adult chum are encountered during broodstock collection activities they are held in hoop nets at the capture site and are transported to the hatchery in insulated plastic totes. Upon arrival at the hatchery fish are released into hoop nets suspended in fiberglass circular tanks. Green males and females are held separately.
- 7.7 Fish health maintenance and sanitation procedures: No fish health maintenance procedures are conducted during the pre-spawn holding period at the hatchery facility. Pre-spawning mortalities are removed from the pond, sampled for coded wire tags, and are disposed of by in-river carcass nutrient enrichment.
- 7.8 Carcass Disposition: All fish are utilized in in-river nutrient enrichment programs
- 7.9 Risk aversion measures employed to minimize adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection process: No chinook salmon are present in the Elwha River during the adult chum salmon collection period.

SECTION 8. MATING

- 8.1 Selection method: spawners are selected randomly from ripe fish on a given day. Due to limited broodstock numbers spawning matrices are employed to maximize genetic expression.
- 8.2 Males: Repeat spawners are utilized when necessary.
- 8.3 Fertilization: Females are spawned and eggs held separately. These eggs are divided into lots. Eggs are rinsed with a buffered sodium bicarbonate solution to remove debris and promote sperm motility. The rinse solution is then poured-off. Males are spawned and sperm is held separately for each fish. Spawning matrices are developed based upon available fish. Water is added to initiate sperm motility. Eggs are loaded into vertical tray incubators and allowed to water-harden for 60 minutes in 3 liters of 100 PPM buffered PVP iodine solution. Following water-hardening incubation flows are begun at 3.0 GPM.
- 8.4 Cryopreserved Gametes: No use of cryopreservation is employed in the coho salmon program at the hatchery.
- 8.5 Risk aversion measures employed to minimize adverse genetic or ecological effects to listed natural fish resulting from the mating scheme: No known adverse genetic or ecological effects to listed natural fish will result from current chum salmon mating practices employed at the Lower Elwha Fish Hatchery.

SECTION 9. INCUBATION AND REARING

9.1 Incubation

- 9.1.1 Number of eggs taken and survival rates to eyed-up and/or ponding:

TABLE 9.1.1 CHUM EGG TAKE LEVELS AND SURVIVAL

Year	Green Eggs	Eyed Eggs	Survival to Eyed Stage
1995	42,435	37,796	89.1%
1996	55,154	45,621	82.7%
1997	20,925	17,710	84.6%
1998	69,174	62,638	90.6%
1999	No capture of Broodstock Made		
2000	No capture of Broodstock Made		
2001	49,434	48,370	97.8%
2002	65,678	62,782	95.6%
Average	50,467	45,820	90.8%

9.1.2 Cause for, and disposition of surplus egg takes: No eggs in excess to program needs have been.

9.1.3 Loading densities applied during incubation

9.1.3.1 Egg size data (egg weight)

TABLE 9.1.3.1 CHUM EGG SIZE

Year	Egg Size (Eggs/Gram)
1995	3.79
1996	3.79
1997	3.92
1998	3.82
1999	NA
2000	NA
2001	3.94
2002	4.02

9.1.3.2 Standard incubation flows: 3.0 GPM

9.1.3.3 Standard Loading per Heath Tray (eggs/tray)

TABLE 9.1.3.3.1 CHUM EGG INCUBATIONAL LOADING DENSITIES (GREEN TO EYED)

Year	Range	Green to Eyed Eggs/Tray	Grams/Tray	Grams/GPM
1995	5,575 to 1,743	3,266	851	284
1996	5,249 to 1,531	2,884	761	254
1997	4,887 to 2,777	3,488	761	254
1998	5,563 to 2,799	4,528	1,185	395
1999				
2000				
2001	6,566 to 1,191	5,485	1,392	464
2002	5,806 to 1,826	4,865	1,210	403
Average	5,318-2,213	4,086	922	307

TABLE 9.1.3.3.1 CHUM EGG INCUBATIONAL LOADING DENSITIES (EYED TO HATCH)

Year	Range	Eyed to Hatch		Grams/GPM
		Eggs/Tray	Grams/Tray	
1995	5,701-666	3,252	831	277
1996	3,129-614	1822	481	160
1997	4,700-1,682	2952	753	251
1998	0	0	0	0
1999	Na			
2000	Na			
2001	Na			
2002	Na			
Average	4,510-987	2,675	688	229

- 9.1.4 Incubation conditions: Incubation facility is supplied by constant temperature ground water. Incubational development is tracked on a weekly basis. At 600 CTU °F eggs are shocked, sorted to remove non-viable eggs, inventoried, and retrayed prior to hatching.
- 9.1.4.1 Eggs incubated to hatching at the hatchery are retrayed in Heath trays with triple-layer of Vexar screening to inhibit coagulated yolk condition. No siltation occurs during incubation process.
- 9.1.4.2 Eyed eggs to be remotely incubated are transferred into remote egg incubators (Jordan-Scotty Salmon Condominiums ©, Scott Plastics LTD, Victoria, BC). Planting densities are 1,000 eggs per incubator unit. Eggs are transported in the remote incubators to outplanting locations and are buried in gravel 6 to 12 inches below grade. Conditions in the planting locations fell into three categories:
- Well sorted gravels found in newly constructed spawning channels
 - Undisturbed areas characterized by mixed substrate materials
 - Areas disturbed by habitat restoration work, containing mixed, unstable substrate materials

Naturally spawning fish are given site selection priority, and no observed redds are disturbed in the siting of remote incubator locations. Survival of eggs and resulting fry is dependent upon incubator location and the substrate characteristics found in the planting site.

- 9.1.5 Ponding:
Degree of button-up: mostly buttoned-up. Small suture remains visible at time of ponding.
Cumulative temperature units: 1,512 CTU° F
Mean length: unknown
Mean weight: 0.378 grams/fish
- 9.1.5.1 Start dates of ponding

TABLE 9.1.5.1 CHUM EGGS OUTPLANT AND FRY PONDING DATES

Brood Year	Egg Outplant Date		Fry Ponding Date	
	First Date	Final Date	First Date	Final Date
1995	NA		02.21.1996	03.29.1996
1996	02.12.1997	02.14.1997	02.27.1997	04.11.1997
1997	12.31.1997	01.09.1998	03.27.1998	04.01.1998
1998	12.28.1998	02.08.1999	NA	
1999	NA		NA	
2000	NA		NA	
2001	01.10.2002	01.17.2002	NA	
2002	01.09.2003	01.09.2003	NA	

- 9.1.5.2 Method of swim-up and ponding: forced (fish transferred manually to early-rearing raceways).
- 9.1.6 Fish health maintenance and monitoring: Fungus controlled by means of formalin drip treatments (166 PPM for 15 minutes, 3 days of treatment per 10 days rearing).
- 9.1.6.1 Disease monitoring: No disease monitoring of adult broodstock or juveniles occurs.
- 9.1.6.2 Yolk-sac malformation incidence: Yolk sac malformations are not observed in eggs. Egg incubation strategies are employed (3.0 GPM flows and use of incubational substrate) to prevent these malformations from occurring.
- 9.1.6.3 Egg mortality removal methods: At eyed stage eggs removed mechanically and manually. Mortalities experienced following retraying of eggs are not removed until ponding of fry.
- 9.1.7 Risk aversion employed to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation: Incubation will not genetically and ecologically effect listed fish.
- 9.2 Rearing
- 9.2.1 Survival data by hatchery life stage for the most recent 8 years

TABLE 9.2.1 CHUM SURVIVAL RATES

Brood Year	Fry to Release	Egg to Emigration
1995	99.0%	NA
1996	87.0%	86.2%
1997	NA	56.9%
1998	62.0%	79.6%
1999	NA	NA
2000	NA	NA
2001	NA	93.6%
2002	NA	Pending
Average		

- 9.2.2 Density and loading criteria (goals, actual levels, and observed extremes)

TABLE 9.2.2 CHUM PRODUCTION LOADING DENSITIES

Rearing unit	Flow Based Densities (LBS/GPM/inch fish length)			Volume Based Densities (LBS/FT3/inch fish length)		
	Optimal values	Observed averages	Observed Extremes	Optimal values	Observed averages	Observed Extremes
Optimal ¹	1.20			0.30		
Raceways		NA	NA		NA	NA

1. Optimal values established by staff of Northwest Indian Fisheries Commission Tribal Fish Health Center.

9.2.3 Fish rearing conditions Ponds are monitored weekly for temperature and discharge flows. Fish health is monitored monthly or as needed by staff of the NWIFC Tribal Fish Health Center.

9.2.4 Monthly fish growth information: NA

9.2.5 Monthly fish growth rates: not available

9.2.6 Feed types used, feed rates, application information

TABLE 9.2.6 FEED TYPES AND USES

Developmental Stage	Rearing unit	Feeding Frequency	Feed Rates	Feed Manufacture	Feed Type & Size	Moisture Content
Fry to release	Raceways	5x/day 7 day/wk	1.8%BW/Day	Moore Clark	Nutra Plus Starter #0,#1,#2	.06%

9.2.7 Fish health monitoring , disease treatment, sanitation: Fish health is monitored throughout the rearing period. Staff from the NWIFC Tribal Fish Health Center visits the hatchery monthly, or as needed. Staff performs routine monitoring of juvenile fish, advises hatchery staff on disease findings, and recommends disease treatments when appropriate. NWIFC staff also provides vaccinations for use in Tribal fish production programs.

9.2.8 Smolt development indices: NA.

9.2.9 Use of NATURAL rearing measures: Natural rearing methodologies are not currently utilized in the chum salmon rearing program

9.2.10 Risk aversion measures applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation: No listed fish will be subjected to propagation under this program. No known adverse genetic or ecological effects to listed natural fish will result from current chum salmon propagation practices currently employed at the Lower Elwha Fish Hatchery.

SECTION 10. RELEASE

10. Describe fish release levels and release practices applied through the hatchery program: Fish are released (forced) at sites on Bosco Slough (WRIA 18.0273). Program management goals for coho salmon at the Lower Elwha Fish Hatchery is for the annual release of up to 35,000 fed fry averaging 45mm length.

Release protocols: Chum salmon reared to release at the hatchery are transported to an off-station release site and are released. Fish leave the release site and travel down Bosco Slough to a series of estuarine beach lakes (RM .1) for a short residency and acclimation period prior to movement into the Strait.

Fish release dates are timed to reduce smolt contact with chum and pink salmon during their outmigration from the Elwha River (late March through Mid-May, Peters 1996) and with chinook smolts following their departure from the WDFW Elwha Rearing Channel (mid June to late June).

Size uniformity of population at release time: No effort is made to produce a uniform-sized population.

Residualization controls: Rates of residualism are not monitored.

10.1 Proposed fish release levels:

TABLE 10.1 PROPOSED CHUM RELEASES

Age Class	Max release #	Fish Size Fish/LBS)	Release Date	Location
Eggs	75,000	NA	December to February	Boston Charlie Creek, Bosco Slough
Unfed Fry	0	NA	NA	NA
Fry	35,000	45mm	March to April	Bosco Slough
Fingerling	0	NA	NA	NA
Yearling	0	NA	NA	NA

10.2 Specific location of proposed releases

10.2.1 River: Elwha River WRIA 18.0273, 18.0274, 18.0275

10.2.2 Release point:

10.2.3 Major Watershed: Elwha River

10.2.4 Basin or Region: Strait of Juan de Fuca

10.3 Actual numbers and size of fish released by age class through the program:

TABLE 10.3 HISTORICAL CHUM RELEASES

Year	Fry Released	Emigrated Fry	Total
1995	37,430	0	37,430
1996	26,731	12,847	39,578
1997	0	10,081	10,081
1998	3,125	45,848	48,973
1999	0		
2000	0		
2001	0	35,231	35,231
2002	0		

10.4 Actual dates of release and release protocol description:

TABLE 10.4 CHUM RELEASE DATES

Year	Life History Stage	Start Release	End Release
1995	Fry	3/19/96	4/15/96
1996	Fry	3/14/97	4/11/97
1997	Fry	NA	NA
1998		04.22.1999	
1999	NA	NA	NA
2000	NA	NA	NA
2001	NA	NA	NA
2002	NA	NA	NA

- 10.4.1 Rationale for choosing release dates: Release dates have been chosen based upon fry size (45mm minimum release size) fry readiness (behavior changes, scale loss, feed response) and upon the movements of the offspring of naturally-spawning salmonids in the Elwha River (chum, pink, coho, chinook, steelhead) (Peters 1996).
- 10.5 Fish transportation procedures: Transportation of fish is accomplished using insulated plastic totes.
- 10.6 Acclimation procedures: No acclimation procedures occur during the release phase.
- 10.7 Marks and proportions of total hatchery population marked, to identify hatchery fish: No marks are made on these fish
- 10.8 Disposition plans for fish identified at the time of release as surplus to programmed/approved levels: No fish are produced in excess to programmed levels.
- 10.9 Fish health certification procedures applied pre-release: Representative samples of pre-smolts are taken by staff of the NWIFC Tribal Fish Health Center for diagnostic analysis.
- 10.10 Emergency release procedures in response to flooding or water system failure
 - 10.10.1 If emergency occurs prior to scheduled release: Emergency situation will be evaluated and addressed if possible. If emergency cannot be resolved, feeding will be halted and release of fish will begin based upon
 - 10.10.1.1 Loading density of fish in rearing ponds
 - 10.10.1.2 Overall fish health status
 - 10.10.2 If emergency occurs during release:
 - 10.10.2.1 In the event of flooding: The facility is currently protected by a flood control levee constructed by the Army Corps of Engineers. Following levee construction, the facility has been free of impacts and flooding. During a flood event on-going releases of fish would have to be halted until the end of the event.
 - 10.10.2.2 In the event of water system failure: water distribution pattern would be evaluated and altered to insure an even distribution of remaining water sources to rearing ponds
- 10.11 Given the perceived risks associated with hatchery programs (see Section 3.5), hatchery chum salmon are reared and released in a manner to minimize potential negative impacts on listed chinook salmon and bull trout populations. These risk aversion measures applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases: The Lower Elwha Fisheries Office conducts annual surveys of estuarine habitat prior to smolt release periods to evaluate movements of natural-origin fish from the system. The presence or absence of critical stocks in these habitats is used annually to establish release schedules from the hatchery. The timing of fish releases from the Lower Elwha Fish Hatchery have since 1996 been altered so that smolt releases occur either following the movement of fish from the system (in the case of pink and chum salmon) or prior to the movement of fish from the system periods (as in the case of chinook salmon): No adverse genetic or ecological effects to listed fish are expected to result from outplants of eggs or release of chum fry.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

- 11.1 Monitoring and evaluation of "Performance Indicators" presented in section 1.10:
 - 11.1.1 Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program:

11.1.1 Performance Indicator Monitoring and Evaluation Plans

Program Goal	Performance Standard	Performance Indicator	Monitoring and Evaluation Plan
1.8.1 Recover stocks of chum salmon in the Elwha River	Increase the total abundance of the composite natural/hatchery population	An increased number of fish returning to the river to spawn is observed	Lower Elwha Fish Hatchery Operations Plan
	Hatchery production of chum salmon meets the production goal of 75,000 eyed eggs for outplanting and/or release	A broodstock capture goal of 100 fish (50 pairs) is attained	
		100 spawners which will produce eggs necessary to meet annual hatchery production goal	
		Egg take of 110,000 eggs will achieve a survival sufficient to produced 75,000 eggs for outplanting or fry release.	
	Fish diseases will be detected and treated when necessary to maintain and improve health in hatchery production	When appropriate, returning adult broodstock will be tested at levels sufficient to detect viral and bacterial infections	Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State. Lower Elwha Fish Hatchery Operations Plan. Tribal Fish Health Center Services Manual. AFS Bluebook.
		Eggs will receive appropriate disinfection during incubation period to minimize fungal and bacterial infections	Lower Elwha Fish Hatchery Operations Plan. Tribal Fish Health Center Services Manual. AFS Bluebook.
		Health of hatchery stocks will be monitored on a monthly basis and preventative actions/strategies to maintain fish health will be recommended	Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State. Lower Elwha Fish Hatchery Operations Plan. Tribal Fish Health Center Services Manual. AFS Bluebook.

		Health status of fry will be assessed prior to release from the facility	Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State. Lower Elwha Fish Hatchery Operations Plan. Tribal Fish Health Center Services Manual.
1.8.2 Minimize adverse ecological and behavioral effects upon listed stocks of chinook salmon	Hatchery production of chum salmon has a minimal impact on the numbers and survival of listed salmon stocks	Adult chinook are not targeted by broodstock capture program	Lower Elwha Fish Hatchery Operations Plan.
		Outplanting of eyed chum salmon eggs will occur in areas not utilized by chinook salmon for spawning	

11.1.1.2 Monitoring Plans

11.1.1.2.1 Lower Elwha Fish Hatchery Operations Plan

11.1.1.2.2 Puget Sound Salmon Management Plan

11.1.1.2.3 Draft Comprehensive Coho Management Plan

11.1.1.2.4 Draft Comprehensive Chinook Management Plan

11.1.2 Indicate whether funding, staffing and other support logistics are available or committed to allow implementation of the monitoring and evaluation process:

TABLE 11.1.2 FUNDING AND STAFFING AVAILABILITY

Performance Indicator	Monitoring Needs		Evaluation Needs	
	Funding Available?	Staffing Available?	Funding Available?	Staffing Available?
Increased number of fish returning to river to spawn	Y	Y	Y	Y
A broodstock capture goal of 100 fish (50 pairs) is attained	Y	Y	Y	Y
100 spawners which will produce eggs necessary to meet annual hatchery production goal	Y	Y	Y	Y
Egg take of 110,000 eggs will achieve a survival sufficient to produce 75,000 eggs for outplanting or fry release	Y	Y	Y	Y
When appropriate, returning adult broodstock will be tested at levels sufficient to detect viral and bacterial infections	Y	Y	Y	Y
Eggs will receive appropriate disinfection during incubation period to minimize fungal and bacterial infections	Y	Y	Y	Y
Health of hatchery stocks will be monitored on a monthly basis and preventative actions/strategies to maintain fish health will be recommended	Y	Y	Y	Y
Health status of fry will be assessed prior to release from the facility	Y	Y	Y	Y
Adult chinook are not targeted by broodstock capture program	Y	Y	Y	Y
Outplanting of eyed chum salmon eggs will occur in areas not utilized by chinook salmon for spawning	Y	Y	Y	Y

11.2 Risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities: no adverse genetic and ecological effects to listed fish are expected to result from monitoring and evaluation activities.

SECTION 12 RESEARCH

- 12.1 Objective or purpose:** An analysis of outmigration timing of both natural-origin and hatchery-origin fish on the Elwha River: A screw-trap stationed at RM 0.6 will be operated from April to July 2003 and will monitor the downstream movement of salmonids in the Elwha River.
- 12.1.1 Cooperating and funding agencies: Elwha Klallam Tribe; NWFSC; NWIFC.
- 12.1.2 Principle investigator and staff: Mike McHenry
- 12.1.3 Status of stock affected by project: See Section 2.
- 12.1.4 Techniques: A screw-trap stationed at RM 0.6 will be operated in the Elwha River to monitor the downstream movement of salmonids in the Elwha River. Fish captured by the trap will be counted, measured and their origin established, if possible. Fish of hatchery origin will have their gastric contents sampled to evaluate potential predation by hatchery-origin fish on natural origin fish.
- 12.1.5 Dates or time period in which research activity occurs: March to June 2003 (February to July 2004).
- 12.1.6 Care and maintenance of live fish or eggs, holding duration, transport methods: Detailed protocols for handling fish are pending and will be included in an updated HGMP.
- 12.1.7 Expected type and effects of take and potential for injury or mortality: See Section 12.2.6.
- 12.1.8 Level of take of listed fish: See Section 12.2.6.
- 12.1.9 Alternative methods to achieve project objectives: NA
- 12.1.10 List species similar or related to the threatened species: NA
- 12.1.11 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injuries, or mortality to listed fish as a result of the proposed research activities: See Section 12.2.6.
- 12.2 Objective or purpose:** An analysis of distribution, density, habitat utilization and interactions of salmonid species in the Elwha River.
- 12.2.1 Cooperating and funding agencies: Elwha Klallam Tribe; NWFSC; NWIFC.
- 12.2.2 Principle investigator and staff: Mike McHenry
- 12.2.3 Status of stock affected by project: See Section 2.
- 12.2.4 Techniques: Multi-agency staff is conducting snorkel survey throughout the lower Elwha River. During these surveys investigators will visually determine distribution, habitat utilization, population numbers and interactions between salmonid species in the Elwha River.
- 12.2.5 Dates or time period in which research activity occurs: Project was initiated 2000 and is scheduled to continue through 2006 (and beyond, depending upon funding. Snorkel surveys occur quarterly/seasonally.
- 12.2.6 Care and maintenance of live fish or eggs, holding duration, transport methods: NA.
- 12.2.7 Expected type and effects of take and potential for injury or mortality: No handling of fish will occur. No take/potential injury or mortality of fish expected..
- 12.2.8 Level of take of listed fish: NA.
- 12.2.9 Alternative methods to achieve project objectives: NA
- 12.2.10 List species similar or related to the threatened species: NA
- Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injuries, or mortality to listed fish as a result of the proposed research activities: Fish will not be handled or subjected to deleterious stressors

SECTION 13. ATTACHMENTS CITATIONS AND PERMITS

13.1 Attachments

13.1.1 Lower Elwha Fish Hatchery Operational Plan

13.2 Literature Cited

American Fisheries Society, Fish Health Section. 1994. Bluebook – Suggested Procedures for the Detection and Identification of Certain Finfish and Shellfish Pathogens. USFWS.

Comprehensive Coho Artificial Production Workgroup. 1988. Comprehensive coho management plan: Artificial production. Draft Manuscript. June 25, 1998. 21 p.

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Hargreaves NB, LeBrasseur RJ. 1985. Species selective predation on juvenile pink (*Onchorhynchus gorbuscha*) and chum salmon (*O. keta*) by coho salmon (*O. kisutch*). Canadian Journal of Fisheries and Aquatic Sciences 42:659-668

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Pearsons TN, Fritts AL. 1999. Maximum size of chinook salmon consumed by juvenile coho salmon. North American Journal of Fisheries Management 19:165-170.

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Peters, RJ. 1996. Emigration of Juvenile Chum Salmon in the Elwha River and Implications for Timing Hatchery Coho Salmon Releases. USFWS. Olympia, WA.

Puget Sound Treaty Tribes and Washington Department of Fish and Wildlife. 1985. Puget Sound salmon management plan. Mat 15, 1985. Adopted by the United States District Court, Western District of Washington, No. 9213, sub-proceeding no. 85-2. 42 p.

Puget Sound Treaty Tribes and Washington Department of Fish and Wildlife. 1998. Comprehensive coho management plan. Second interim report, May 5, 1998. 12 chapters, + 4 app.

Washington Department of Fish and Wildlife, Point No Point Treaty Council and Makah Tribe. 1999. 1999 Management Framework Plan and Salmon Runs' status for the Strait of Juan de Fuca Region.

Wunderlich, R.C., C. Panteleo, and R. Wiswell. 1994. Elwha River chum salmon surveys: 1993-1994. USFWS. Western Washington Fishery Resource Office, Olympia, WA.

13.3 Permits

National Pollutant Discharge Elimination System. Permit No. WA-G13-1000 (*Pending*). Tribal Hatcheries and other Upland Aquaculture Facilities in the State of Washington. 2000.

SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

" I hereby certify that the foregoing information is complete, true, and correct to the best of my knowledge and belief. I understand that the information provided in the HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C. 1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant: Larry Ward, Fisheries Biologist

Certified by: _____ Date: _____

Lower Elwha Fish Hatchery Hatchery Operational Plan

Introduction

The hatchery is located on the Elwha River. Constructed in 1976 the hatchery has been in continuous operation, initially as a chum salmon facility, and currently in the production of coho and steelhead salmon. Rearing containers include 24 concrete raceways (4'x40'), eight fiberglass circular tanks (24 ' diameter), four 0.5 acre asphalt rearing ponds, one 1.5 acre earthen rearing pond, and an earthen adult holding pond. Incubation consists of vertical stack incubators with an instantaneous incubation capacity of 6.7 million eggs. Water for the facility is supplied from wells and a gravity-flow infiltration system located on the Elwha River. The Lower Elwha Hatchery serves as the major production source of winter coho and winter steelhead salmon for the Elwha River.

Purpose And Goals

The Lower Elwha Hatchery production goal is to produce coho and steelhead smolts for in-river (Elwha River specific) terminal harvest opportunity (commercial, subsistence, ceremonial, and recreational).

Objectives

Objective 1: Hatchery Production

Coho Salmon:

Collect 1,200,000 winter coho eggs

Rear and release 750,000 yearling coho smolts on-station

Steelhead Salmon:

Collect 160,000 winter steelhead salmon eggs

Rear 150,000 yearling winter steelhead pre-smolts

Transfer up to 60,000 yearling steelhead pre-smolts to the WDFW Elwha Rearing Channel for imprinting, final rearing and release.

Release up to 150,000 yearling steelhead smolts on-station

Chum Salmon:

Collect up to 100,000 chum salmon eggs

Rear for release or outplanting 75,000 eyed eggs or fed fry

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies

Objective 3: Maintain stock integrity and genetic diversity of each stock through proper management of genetic resources

Objective 4: Maximize survival at all life history phases using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with tribal, state, and federal water quality standards

Objective 6: Communicate effectively with other fisheries managers in the region

Current Practices To Achieve Objectives

Objective 1: Hatchery Production

Adult Collection and Disposition

The primary intent of the adult collection program at the Lower Elwha Hatchery is to collect enough adults of each species to maintain each of the programs while meeting guideline designed to maintain genetic diversity of stocks. Brood fish are permitted to voluntarily return to the facility. Fish enter the facility by means of an outfall creek constructed for the hatchery. At the head of the outfall creek is a trap with the fish enter. In the trap fish are sorted one to two times per week for species, sex, and state of sexual ripeness. Green males and females are held separately prior to spawning.

Winter Coho Salmon: Coho return to the hatchery from October to November with peak spawning in November and December.

Winter Steelhead Salmon: Winter steelhead return to the hatchery from December to February with peak spawning taking place in January.

Chum Salmon: Chum salmon return to the Elwha River from October to December with peak spawning in December.

Spawning

GENERAL PROTOCOLS: Male to female spawning ratio will be 1:1. Precocious males (jacks) will be spawned at a rate not to exceed 5% of the total male spawning component. Sperm from individual males will be kept separate prior to fertilization in order to maximize genetic input and potential representation of individual genetic material. Eggs from 20 females are pooled.

FISH HEALTH CERTIFICATION:

Coho: Adult female salmon are sampled at 60 kidney/spleen samples and 150 ovarian fluid samples annually for viral analysis.

Steelhead: 100% of all females spawned have both kidney/spleen and ovarian fluid sampled for viral analysis.

Chum: 100% of females spawned at the hatchery have both kidney/spleen and ovarian fluid sampled for viral analysis.

Fertilization and Incubation

Eggs and sperm are fertilized mixed at a rate 1 male to 1 female. Due to the mixing of eggs this produces an effective 20:20 spawning matrix.

Fertilized eggs are trayed-out into vertical stack incubators within 5 minutes of being fertilized and are water hardened for a minimum 60 minutes in a 100 PPM solution of PVP iodine. Traying rates at this point do not exceed 12,000 eggs per tray. Following water hardening eggs are incubated in pathogen-free well water (48° F constant water temperature). Incubator flows are 3.0 GPM.

During the incubational period eggs receive a prophylactic formalin treatment (167 PPM for 15 minutes, 3 days in 10) to prevent fungus colonization.

As eggs reach the eyed stage the eggs are physically shocked, non-viable eggs are removed, and inventories are taken to assess inventories and establish rates of survival to the eyed stage of physiological development.

Eggs are re-trayed at a rate not exceeding 5,000 eggs per tray for the final incubational period.

Anti-fungal prophylactic formalin treatments are terminated 10 days prior to hatching to limit potential formalin-related hatching mortalities.

Following initial incubation (600 CTU °F) all or a portion of the eyed chum eggs are transferred into remote egg incubators (Jordan-Scotty Salmon Condominiums ©, Scott Plastics LTD, Victoria, BC). Planting densities were 1,000 eggs per incubator unit. These incubators are then buried in gravel 6 to 12 inches below grade

Ponding of fry occurs following the absorption of egg material. Fry are manually transported from incubation facilities to raceways and feeding is initiated.

Carcass Disposition

Adult salmon collected in excess of hatchery production needs will be made available to tribal community members for ceremonial purposes, regional food banks, or other organizations and groups identified by Tribal Council as qualifying for receipt.

Following spawning, carcasses will be returned when appropriate, to the Elwha River to facilitate in-river nutrient enhancement.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies

Rearing and Release Strategies (General)

Rearing and release strategies are intended to limit the amount of ecological interactions occurring between fish originating in the hatchery, naturally-spawning populations of fish in the river, and ESA listed stocks of chinook salmon. Fish are reared to sufficient size

to encourage a high degree of smoltification so that residualism after release is minimized. Rearing on Elwha River water ensures a strong homing to the hatchery, thus reducing straying of fish into other areas.

Rearing Strategies

Fish are to be reared in accordance with standards identified as optimal by the staff of the Tribal Fish Health Center (NWIFC). These recommended guidelines ensure rearing environment parameters do not adversely impact fish. The guidelines are based upon both flow and volume.

Fish are sampled twice a month for growth and once per month to assess fish health status. Additional sampling occurs on an as-needed basis.

Release Goals (General)

Winter Coho Salmon: Rear 750,000 yearling smolts to a size of 16 Fish/LBS for release in May

Winter Steelhead Salmon: Rear 120,000 yearling smolts to a size of 9 to 6 Fish/LBS for release in May

Chum Salmon: Rear up to 75,000 chum eggs or fry to the eyed stage (eggs) or to a length of 45mm.

Release Strategies

Coho and Steelhead are volitionally released from the facility. Smoltification is monitored upon the basis of behavior (non-physiologically). Releases begin following the identification of those behaviors indicative of smoltification.

Chum reared at the hatchery are transported and released once a minimum size of 45mm is attained.

Objective 3: Maintain stock integrity and genetic diversity of each stock through proper management of genetic resources

Adult Collection

Both coho and steelhead adults are collected throughout the entire run to ensure that the run timing of this stock is maintained. All chum salmon adults collected are utilized for egg production.

Spawning and Fertilization Protocols

Coho: Program goal is to spawn 1,200 adults. Male to female spawning ratio will be 1:1. Precocious males (jacks) will be spawned at a rate not to exceed 5% of the total male spawning component. Eggs are pooled in lots of 20 females. Eggs and sperm are fertilized functionally at a rate 1 male to 1 female. The effective fertilization rate of this spawning matrix is 20:20, due to the pooling of eggs.

Steelhead: Program goal is to spawn 120 adults.

Chum: Program goal is to spawn 75 adults.

Objective 4: Maximize survival at all life history phases using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens

Fish health will be maintained throughout the rearing and release phase by adhering to the guidelines of *the American Fisheries Society Fish Health Section Blue Book*, *The Tribal Fish Health Center Services Manual*, and *the Salmonid Disease Control Policy of the Co-Managers of Washington State*.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with tribal, state, and federal water quality standards

Environmental Monitoring

Environmental monitoring is conducted at tribal facilities with more than 20,000 pounds of annual production to ensure that these facilities meet the requirements of the National Pollution Discharge Elimination Permit System (NPDES) as administered by the Environmental Protection Agency (EPA). Monitoring is also used in managing fish health. The Lower Elwha Fish Hatchery is covered under NPDES permit number WA-G13-1000 (*pending*), which details monitoring parameters and frequencies.

Hatchery Water Supply

Elwha River: The Elwha River has suffered significant down cutting, loss of sediment, loss of channel variability and complexity since the construction of two hydroelectric projects in the early portion of the 20th century. Channelization of the river has reduced the production potential of the facility's infiltration system. Water right is 12 CFS.

Wells: The hatchery is supplied by two production wells. Total water production is currently 4 CFS.

Domestic Water: The hatchery has a well that provides the facility with domestic water. No identified water right exists.

Objective 6: Communicate effectively with other fisheries managers in the region

Record Keeping

Hatchery records pertaining to fish production, feed, use of disease therapeutics, are kept in a consistent manner employing standard formats to provide long term documentation of hatchery activities and monitoring of performance.

Quarterly Reports

Hatchery activities are reported quarterly. These reports detail all hatchery activities occurring during the quarter.

Development and Review of Brood Documents

The **Equilibrium Brood Document** for the Elwha River watershed has been developed. It documents existing baseline production and current management. Two brood documents are reviewed and agreed to annually. The **Future Brood Document** is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The **Current Brood Document** reflects annual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

The **Management Framework Plan and Salmon Runs' Status for the Strait of Juan de Fuca** is an annual document which fulfills the reporting requirements under the provisions of Section 5.2 of the **Puget Sound Salmon Management Plan** and facilitates the management of salmon runs in the Strait of Juan de Fuca. This report establishes estimates of abundance, anticipated harvests, and agreed-upon escapement goals for each management unit.